General Anesthesia

King Saud University
Anesthesia department

General anesthetics have been performed since 1846 when Morton demonstrated the first anesthetic (using ether) in Boston, USA. Local anesthetics arrived later, the first being scientifically described in1884.

General anesthesia is described as a reversible state of unconsciousness with inability to respond to a standardized surgical stimulus.
In modern anesthetic practice this involves the triad of: unconsciousness, analgesia, muscle relaxation.

General Anesthesia

- Assessment
- Planning I: Monitors
- Planning II: Drugs
- Planning III: Fluids
- Planning IV: Airway Management
- Induction
- Maintenance
- Emergence
- Postoperative

Objectives of anesthesia

- Unconsciousness
- Amnesia
- Analgesia
- Oxygenation
- Ventilation
- Homeostasis
- Airway Management
- Reflex Management
- Muscle Relaxation
- Monitoring

Role Of Anesthetists

- Preoperative evaluation and patient preparation
- Intraoperative management
  - General anesthesia
    - Inhalation anesthesia
    - Total IV anesthesia
  - Regional anesthesia & pain management
    - Spinal, epidural & caudal blocks
    - Peripheral never blocks
    - Pain management (acute and chronic pain)
- Postanesthesia care (PACU management)
- Anesthesia complication & management
- Case study

Preoperative anesthetic evaluation

Risks of Anesthesia

Physical status classification

- Class I: A normal healthy patients
- Class II: A patient with mild systemic disease (no functional limitation)
- Class III: A patient with severe systemic disease (some
- functional limitation)
- Class IV: A patient with severe systemic disease that is a constant threat to life (functionality incapacitated)
- Class V: A moribund patient who is not expected to survive without the operation
- Class VI: A brain-dead patient whose organs are being removed for donor purposes
- Class E: Emergent procedure

Anesthetic plan

Premed

	Intraoperative management	Postoperative management
General	Monitoring	Pain control PONV
Airway management	Positioning	Complications
Induction	Fluid management	postop ventilation
Maintenance	Special techniques	Hemodynanic monit
Muscle relaxation		

NPO status

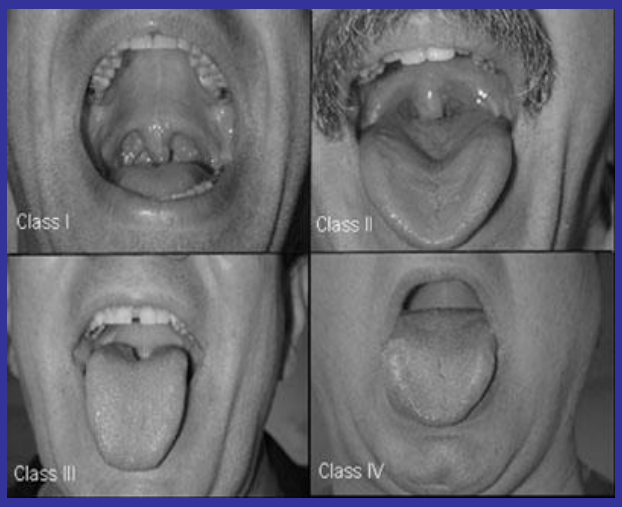
- NPO, Nil Per Os, means nothing by mouth
- Solid food: 8 hrs before induction
- Liquid: 4 hrs before induction
- Clear water: 2 hrs before induction
- Pediatrics: stop breast milk feeding 4 hrs before induction

General Anesthesia

1. Monitor
2. Preoxygenation
3. Induction (including RSI & cricoid pressure)
4. Muscle relaxants
5. Mask ventilation
6. Intubation & ETT position comfirmation
7. Maintenance
8. Emergence

Airway exam

Mallampati classification



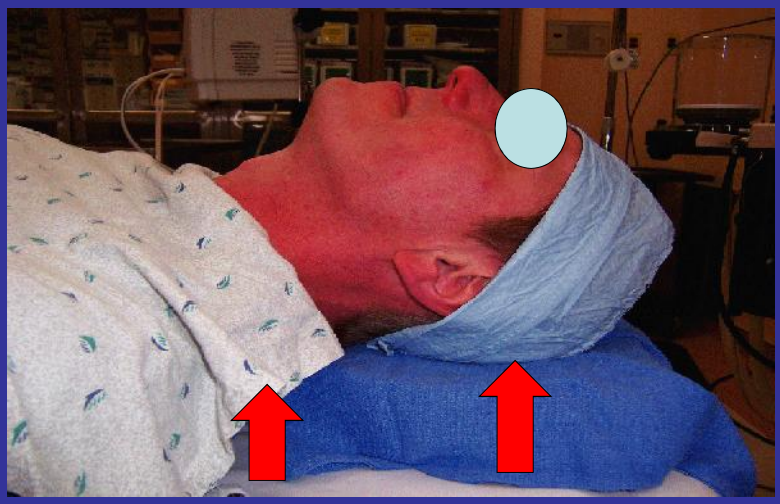
Class I:
uvula, faucial pillars, soft palate visible

Class II:
faucial pillars, soft pillars visible

Class III:
soft and hard palate visible

Class IV:
hard palate visible

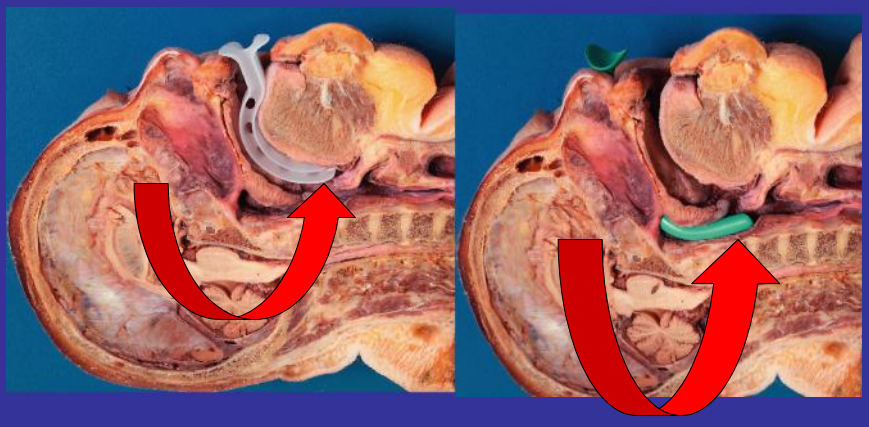
Sniffing position



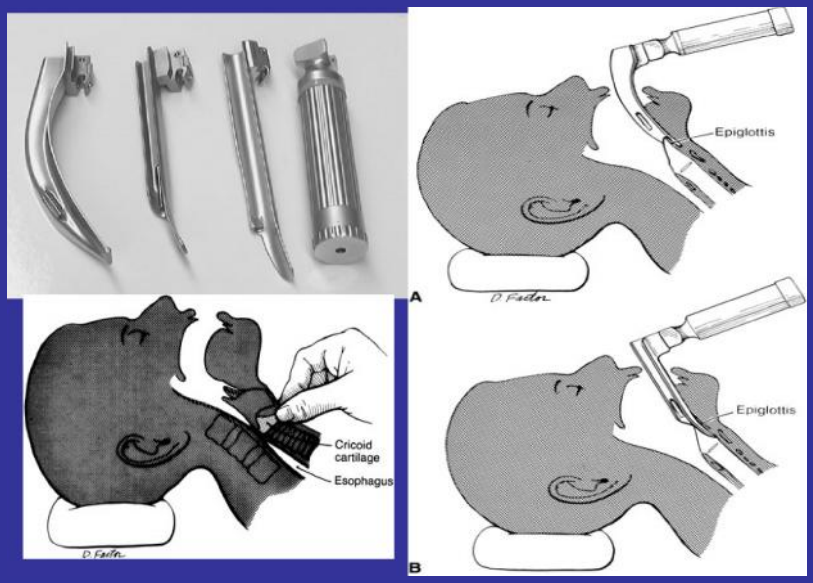
Mask and airway tools

Mask ventilation and intubation

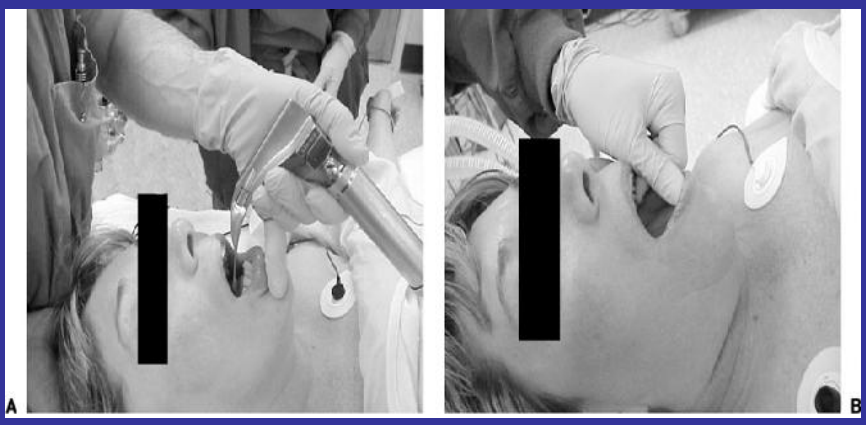
Oral and nasal airway



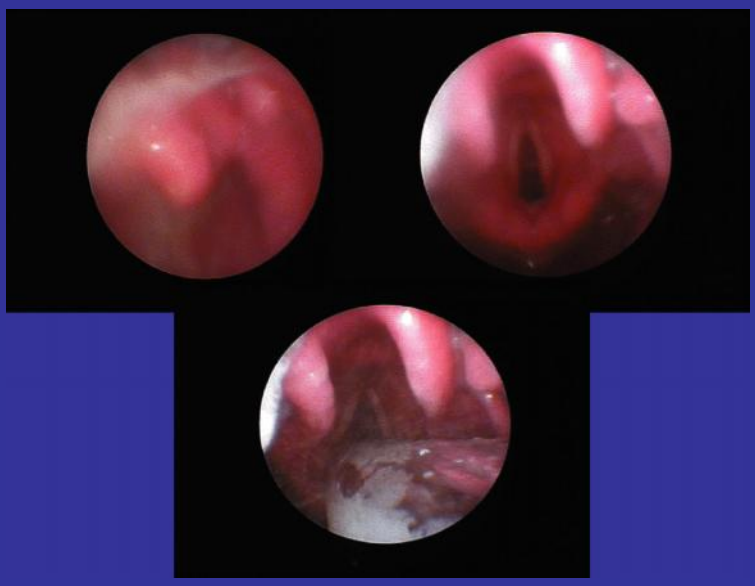
Intubation



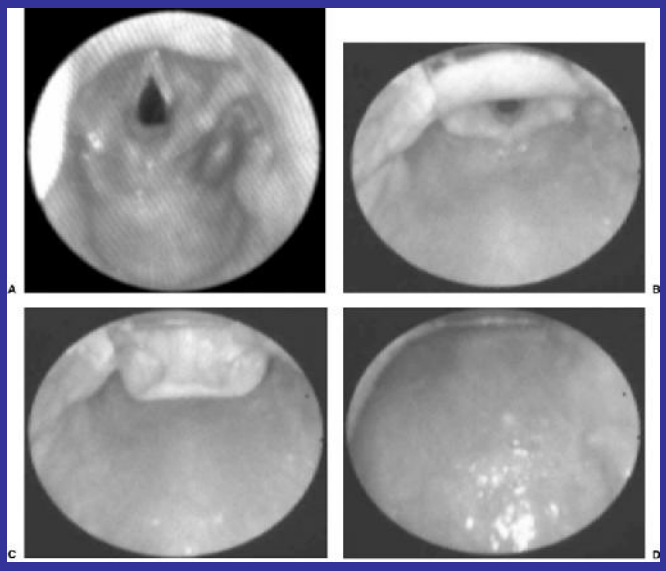
Intubation



Laryngeal view



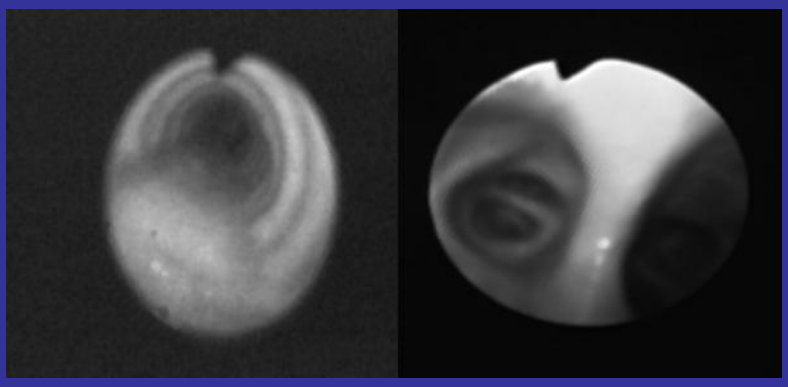
Laryngeal view scoring system



Difficult airway

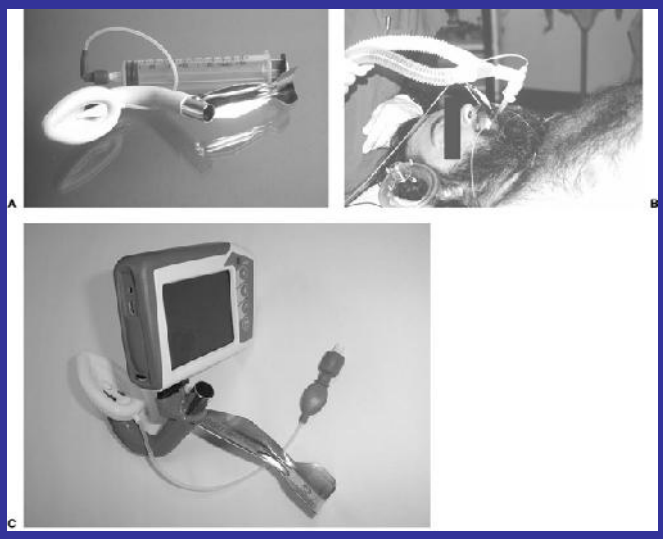
Fiberoptic scope intubation

Trachea view Carina view

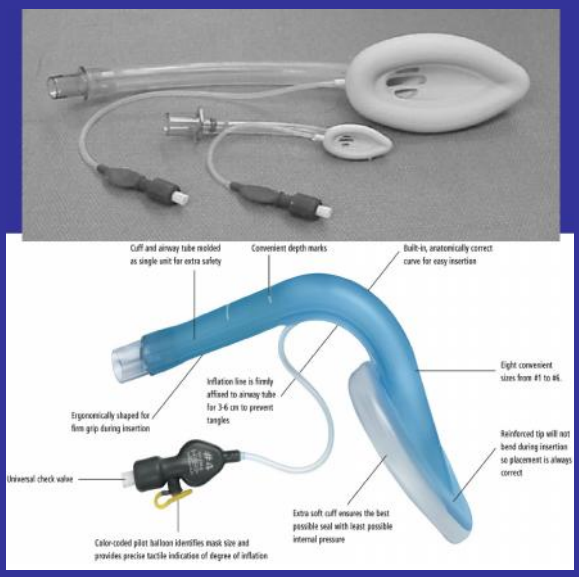


Glidescope

Fast track LMA



LMA



Induction agents

- Opioids – fentanyl
- Propofol, Thiopental and Etomidate
- Muscle relaxants:
  - Depolarizing
  - Nondepolarizing

Induction

- IV induction
- Inhalation induction

General Anesthesia

- Reversible loss of consciousness
- Analgesia
- Amnesia
- Some degree of muscle relaxation

Intraoperative management

- Maintenance
  - Inhalation agents: N_2O, Sevo, Deso, Iso
  - Total IV agents: Propofol
  - Opioids: Fentanyl, Morphine
  - Muscle relaxants
  - Balance anesthesia

Intraoperative management

- Monitoring
- Position – supine, lateral, prone, sitting, Litho
- Fluid management
  - Crystalloid vs colloid
  - NPO fluid replacement: 1st 10kg weight-4ml/kg/hr, 2nd 10kg weight-2ml/kg/hr and 1ml/kg/hr thereafter
  - Intraoperative fluid replacement: minor procedures 1-3ml/kg/hr, major procedures 4-6ml/kg/hr, major abdominal procedures 7-10/kg/ml

Intraoperative management
Emergence

- Turn off the agent (inhalation or IV agents)
- Reverse the muscle relaxants
- Return to spontaneous ventilation with adequate ventilation and oxygenation
- Suction upper airway
- Wait for pts to wake up and follow command
- Hemodynamically stable

Postoperative management

- Post-anesthesia care unit (PACU)
  - Oxygen supplement
  - Pain control
  - Nausea and vomiting
  - Hypertension and hypotension
  - Agitation
- Surgical intensive care unit (SICU)
  - Mechanical ventilation
  - Hemodynamic monitoring

General Anesthesia

Complications and Management

- Respiratory complication
  - Aspiration – airway obstruction and pneumonia
  - Bronchospasm
  - Atelectasis
  - Hypoventilation
- Cardiovascular complication
  - Hypertension and hypotension
  - Arrhythmia
  - Myocardial ischemia and infarction
  - Cardiac arrest

General Anesthesia
Complication and Management

- Neurological complication
  - Slow wake-up
  - Stroke
- Malignant hyperthermia

Case Report

Arterial oxygen desaturation following PCNL

The Patient

• Patient : 73 y/o Female
BW 68 kg, BH 145 cm (BMI 32)

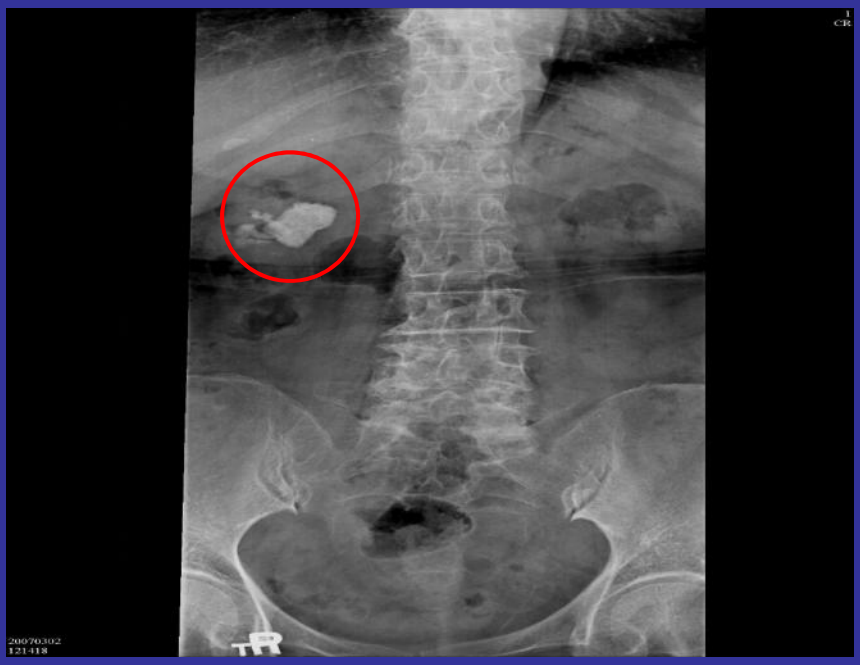
• Chief complaint :
Right flank pain (stabbing, frequent attacks)
General malaise and fatigue

The Patient

• Past history : Hypertension under regular control
Senile dementia (mild)

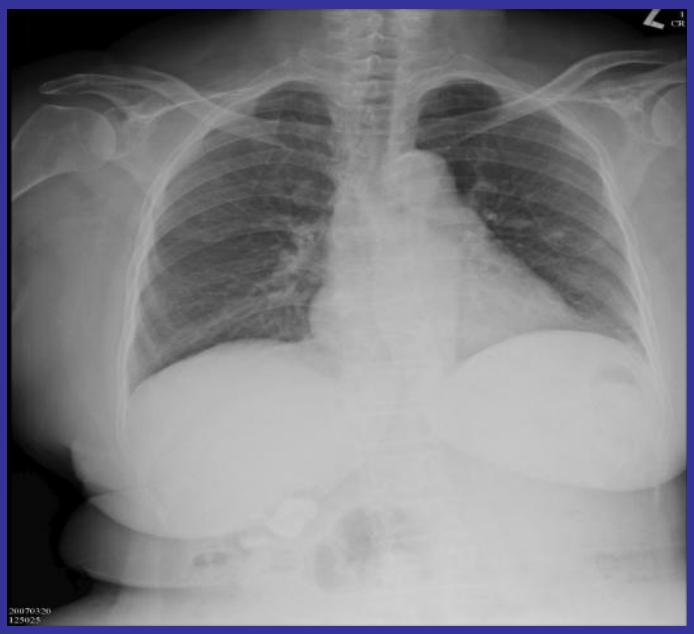
• Preoperative diagnosis : Right renal stone (3.2 cm)

• Operation planned : Right **PCNL** (percutaneous nephrolithotomy)



Pre-anesthetic Assessment

- EKG : Normal sinus rhythm
- CXR : Borderline cardiomegaly & tortuous aorta
- Lab data : Hb 10.5 / Hct 33.2
  BUN 24 / Creatinine 1.1
  GOT 14
  PT, aPTT WNL



Preop

Anesthetic Technique

- General anesthesia with endotracheal intubation
- Standard monitoring apparatus for ETGA
- Induction : Fentanyl ug/kg
  propofol 2mg/kg
  Succinylcholine 80 mg
  Atracurium 25 mg

- Endotracheal tube (ID 7.0-mm) @ 19cm
- Maintenance: Isoflurane 2~3% in O_2 0.5 L/min
- Position: prone
- Blood loss : 300 mL → **PRBC 2U**

Intra-operative Events

- Stable hemodynamics
- Abnormal findings 30 minutes after surgery started

Increased airway pressure 35~40 mmHg

SpO_2 dropped to 90~95%

- Bilateral breathing sounds were still audible then
- Management : Solu-cortef 100 mg IV stat
  Aminophylline 250 mg IV drip
  Bricanyl 5 mg inhalation

Intra-operative Events

- **ABG data**

pH	**7.2**
PaO_2	**90.5**
$PaCO_2$	**66.8**
HCO_3^-	**26.0**
BE	**-2.4**
Na^+	**143.0**
K^+	**4.0**
Ca^{2+}	**1.1**
Hb/Hct	**11.4/36.1**

Post-operative Course

- The patient's condition was kept up until the end of surgery
- SpO_2 90~92% after the patient was placed in the supine position again with diminished breathing sound over right lower lung
- The patient was transferred to SICU for further care (*)
- Chest X-ray was followed in SICU

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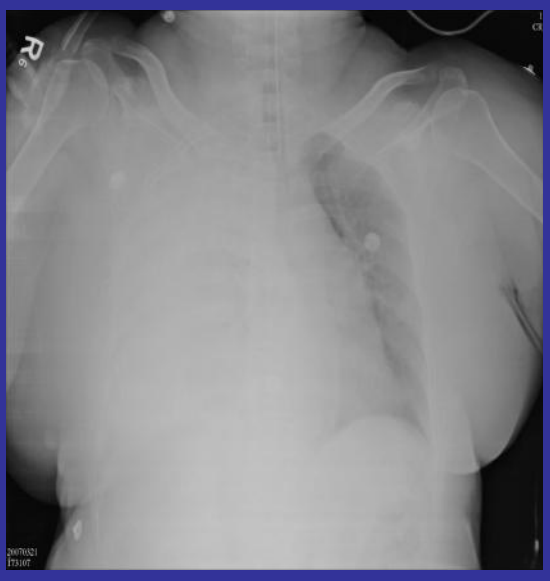


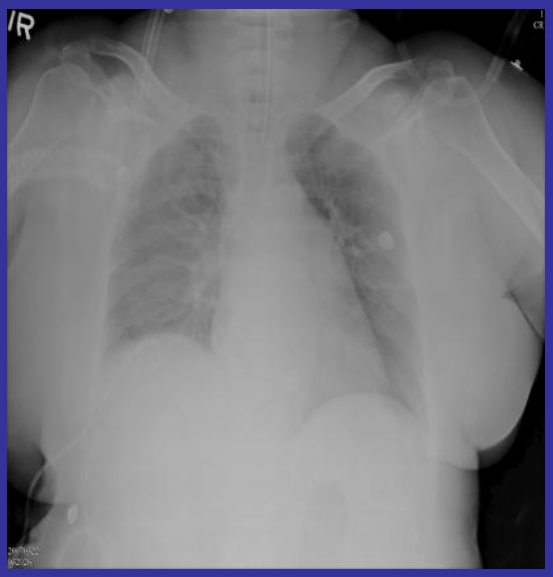
Immed. Postop

Preop

Immed. Postop

Postoperative Course

- Pigtail drainage in SICU
- Pleural effusion : bloody
  - RBC numerous
  - WBC 7800 (Seg 94%)
  - Gram stain (-)
- Impression : Right hydrothorax and hemothorax



s/p pigtail

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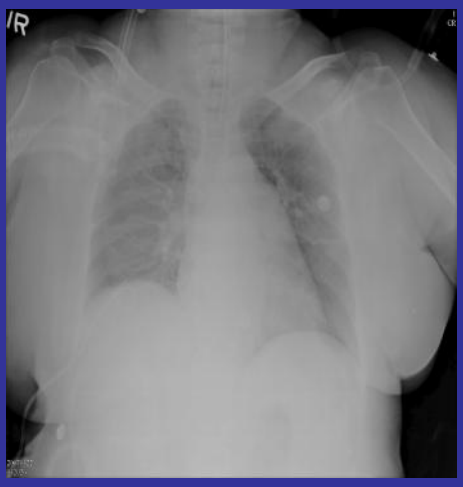

Immed. Postop

s/p pigtail

Postoperative Course

- Extubation and transfer to ordinary ward
- Pigtail removed